

REMARKS

This is in response to the Office Action mailed on August 15, 2005 in which claims 1-19 were rejected. With this Amendment, independent claims 1, 9 and 12 have been amended, and dependent claims 2-3, 8, and 14-16 have been amended. Claims 1-19 are pending in this Application.

Claim Amendments

Claims 1 and 12 have been amended to correct grammatical informalities. Specifically, the word "causing" has been replaced with the phrase "to cause." Also, the second element of claim 12 has been amended to recite "forming a tunnel barrier on the first ferromagnetic layer;". Finally, the word "and" has been inserted before the last element of the claim.

Claim 12 has also been amended to clarify that replenishing the deficiency of the constituent occurs in the portion of the tunnel barrier adjacent the air bearing surface.

Claims 14-16 have been amended to delete the phrase "comprising a constituent."

Claim Rejection - 35 U.S.C. § 112

In the Office Action, claim 19 was rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. Specifically, the Office Action states that a claim cannot be both a process and a product claim.

Product-by-process claims are not indefinite. M.P.E.P. § 2173.05(p) states that, "A product-by-process claim, which is a product claim that defines the claimed product in terms of the process by which it is made, is proper."

Claim 19 recites "A tunneling magnetoresistive head, formed according to the method of claim 12." Because this is a product claim that defines the claimed product in terms of the process by which it is made, the claim is proper. Reconsideration and notice to that effect is requested.

Claim Rejections - 35 U.S.C. § 103

In the Office Action, claims 1-19 were rejected under 35 U.S.C. § 103(a) as being unpatentable over the Segar et al. patent (U.S. Patent No. 6,368,425) in view of the Church et al. patent

application (U.S. Publication No. 2004/0180608) and the Kawawake et al. patent application (U.S. Publication No. 2002/0036876). With this Amendment, independent claims 1, 9, and 12 have been amended to recite ion etching the air bearing surface, and replenishing the constituent in the portion of the tunnel barrier adjacent the air bearing surface. Because the prior art of record does not teach or suggest each and every element of amended independent claims 1, 9, and 12, the claims are now allowable.

Focusing on independent claim 1, the prior art does not teach or suggest all elements of the claim. Claim 1 recites a method of forming a tunneling magnetoresistive head. The method includes, “forming a magnetoresistive stack having a tunnel barrier;” “forming an air bearing surface of the tunneling magnetoresistive stack;” “ion etching the air bearing surface to cause deficiencies of a constituent of the tunnel barrier in a portion of the tunnel barrier adjacent the air bearing surface;” and “replenishing at least a portion of the constituent in the portion of the tunnel barrier adjacent the air bearing surface.”

There is no teaching or suggestion in the prior art of “ion etching the air bearing surface to cause deficiencies of a constituent of the tunnel barrier.” The Office Action admits that this element is not taught by the Segar patent (page 3, lines 18-20), but states that it is suggested by the Church patent application. Although the Church patent application does discuss ion bombardment, it does not teach or suggest ion etching “to cause deficiencies of a constituent of the tunnel barrier.” Even if the Church method were used with a TMR device, it would have no effect on the tunnel barrier. FIGS. 4B and 4C show that the Church method protects head structures 402 during ion bombardment by placing a mask 406 over head structures prior to the ion bombardment. (*See also*, page 2, paragraphs 34-36.) Because the head structures 402 would contain the tunnel barrier in a TMR device, ion bombardment has no effect on the tunnel barrier. As a result, the Church patent application does not teach or suggest ion etching the air bearing surface to cause deficiencies of a constituent of the tunnel barrier.

The Kawawake patent also fails to teach or suggest “ion etching the air bearing surface to cause deficiencies of a constituent of the tunnel barrier.” The Kawawake method includes an ion milling process that forms the lateral sides of MR element 10. (*See*, paragraphs 52 and 53 and corresponding

FIGS. 4-7.) Because the lateral sides of MR element 10 are not the air bearing surface, the Kawawake method does not teach or suggest ion etching the air bearing surface. Therefore, amended independent claim 1, which recites “ion etching the air bearing surface,” is now allowable.

There is also no teaching or suggestion in the prior art of “replenishing at least a portion of the constituent in the portion of the tunnel barrier adjacent the air bearing surface.” The Office Action admits that this element is not taught by the Segar patent (page 3, lines 20-21), but states that it is suggested by the Church patent application. As discussed above, the Church method of ion bombardment has no effect on the tunnel barrier, because the tunnel barrier is covered by a mask. As a result, the Church patent application does not teach or suggest this element of claim 1. The Kawawake patent also does not teach or suggest “replenishing at least a portion of the constituent in the portion of the tunnel barrier adjacent the air bearing surface.” Specifically, the Kawawake method involves oxidizing the lateral sides of an MR element, rather than the air bearing surface. (*See*, for example, paragraphs 9, 34, and 38.) Because neither of the lateral sides of the MR element are the air bearing surface, Kawawake does not teach or suggest replenishing at least a portion of the constituent in the portion of the tunnel barrier adjacent the air bearing surface. As a result, claim 1 is now allowable.

Independent claims 9 and 12 are also allowable based upon the above. Claim 9 recites “ion etching the air bearing surface in the presence of a constituent source to replenish a constituent of the tunnel barrier in a portion of the tunnel barrier adjacent the surface.” Claim 12 recites “ion etching the air bearing surface to cause a deficiency of a constituent of the tunnel barrier in a portion of the tunnel barrier adjacent the air bearing surface;” and also, “replenishing the deficiency of the constituent in the tunnel barrier adjacent the air bearing surface.” As described above, these features of the present invention are not taught or suggested by the prior art. Therefore, independent claims 9 and 12 are also allowable. Dependent claims 2-8, 10-11, and 13-19 depend from allowable independent claims 1, 9, and 12 and are therefore allowable.

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Conclusion

In view of the foregoing, this application containing pending claims 1-19 is in condition for allowance. Reconsideration and notice to that effect is respectfully requested.

Respectfully submitted,

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